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ADP MASTER PLAN

Volume I

January, 1982

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Richard D. Lamm, Governor

R. Garrett Mitchell, Executive Director

Department of Administration

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STATE OF COLORADO

DEPARTMENT OF ADMINISTRATION
1525 Sherman Street, 7th Floor
Denver, Colorado 80203
Phone (303) 866-3221

Richard D. Lamm
Governor

R. Garrett Mitchell
Executive Director

A. Y. Levine
Deputy Director

February 24, 1982

The Honorable Richard D. Lamm
Governor, State of Colorado
State Capitol Building
Denver, Colorado 80203

Dear Governor Lamm:

Attached please find a copy of the 1982 Automated Data Processing (ADP) Master Plan for the State of Colorado.

The 1982 ADP Master Plan was prepared by the Division of ADP in accordance with CRS 24-30-613. It contains the managed growth approach to ADP which began in 1977 for improving the data processing services to all State users, and at the same time take advantage of the cost effectiveness related to large scale computer facilities.

The 1982 ADP Master Plan is published in three volumes. Volume I addresses the need to properly plan for ADP needs by identifying and providing cost/benefit information for planned new or revised applications and the cost of maintaining existing applications. Volume I also summarizes the overall status of ADP in Colorado and identifies planning objectives for fiscal year 1982-83. Volume II contains the 1982-83 budget analysis. Volume III is a current inventory of automated applications from all agencies except Higher Education.

I ask your endorsement of the 1982 ADP Master Plan and request your permission to continue implementation of the planning objectives.

Sincerely,

Garrett Mitchell

R. Garrett Mitchell
Executive Director

Attachments

Governor's Approval ____________
Richard D. Lamm, Governor

Date 3-2-82

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STATE OF COLORADO

DIVISION OF AUTOMATED DATA PROCESSING
Department of Administration
1575 Sherman Street, Room 110
Denver, Colorado 80203
Phone (303) 866-2641

1876

Richard D. Lamm,
Governor

R. Garrett Mitchell,
Executive Director

Robert J. Miller,
Director

February 24, 1982

Garrett Mitchell
Executive Director
Department of Administration
7th Floor - State Services Building
1525 Sherman Street
Denver, Colorado 80203

Dear Mr. Mitchell:

The 1982 Automated Data Processing Master Plan for the State of Colorado (three volumes) was prepared by the Division of ADP for your approval in accordance with CRS 24-30-603.

The 1982 Master Plan stresses the importance of agency short range planning on an application level and the need to review and evaluate the viability of existing applications. It continues to support a managed growth approach towards the development and use of State computer centers while encouraging the development of distributed data processing networks when cost effective. It is a strategy for the near term that directly relates to the statewide budget requirements for FY 1982-83.

Sincerely,

Robert J. Miller

Robert J. Miller
Director
Division of Automated Data Processing

RJM/jv

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SECTION I

CURRENT STATUS

1981 ADP Master Plan

Since the reorganization act of 1968 the State has been methodically working toward improvement of data processing services and increasing the utilization of these services. One of the most effective tools to accomplish this has been the planning process. The 1981 ADP Master Plan continued to build strength into the State's data processing services and is the most recent instrument produced in the planning effort.

Activities outlined in the planning process which were completed in the 1981 planning year are:

a. Installation of the new computer equipment and the conversion to a new operating system (DOS to MVS) to fulfill the processing needs of the Department of Revenue.

b. Implemented a Telpak A circuit from Denver to Grand Junction and points in between.

c. Publication of and inventory of automated applications currently being processed on State computers. (Volume III of 1982 ADP Master Plan)

d. The evaluation of Automated Data Processing (ADP) activities at several ADP installations.

e. Installation of the uninterruptible power supply system to provide backup power for the General Government Computer Center and the Administration of Justice Computer Center.

f. Completion of the Personnel segment of the Central Management Information System (CMIS) and planning for the Payroll segment.

g. Installation of a mini-computer (DEC 1170) at Adams State College.

h. Installation of a large computer (Cyber 170 Model 720) and a mini-computer (VAS 11/780) at the University of Colorado Academic Computing Center.

i. Installation of a mini-computer (DEC 1134) at Pueblo Vocational Community College.

j. Installation of a mini-computer (DEC 1144) for instruction at Arapahoe Community College.

k. Installation of a mini-computer (DEC 1144) for instruction at Red Rocks and North Campus of Community College of Denver.

l. Completion of the needs assessment for the General Government Computer Center (GGCC) based upon user agency needs.

Several other identified activities being implemented which are in various stages of completion are:

a. Providing adequate resources for supporting higher education instructional programs.

b. Seeking the necessary funding for additional computing capability at the GGCC.

c. Re-examine the potential of the State microwave facilities and make recommendations on what changes or enhancements are needed to make such facilities effective for data networks.

Agency DP Plans

One of the major thrusts has been to obtain an annual data processing plan from each agency and designated computer center. Each agency plan should indicate the agency's intent, desires, and methodology of achieving data processing support. The aggregate of agency plans are scrutinized to ascertain the more prominent attributes from a Statewide perspective. With this information the Statewide planning effort could be more responsive to needs through planned evolution, as opposed to crisis reaction. Some agencies have failed to provide data processing plans, which is a hinderence to the planning effort. Educating the delinquent agencies of the virtues in planning and encouraging them to provide good short range plans will continue to be emphasized this year. During the past two years, the importance of concentrating the agency planning effort around applications, whether ongoing, revised or new, has been stressed. Appendix A of this document provides a format for agency plans. Future support from within the Division of ADP and Office of State Planning and Budgeting for your requested resources, will be based upon the value of the benefits of new and revised applications, and the allocation or use of existing resources to maintain ongoing applications.

Disaster Recovery Planning

During the past several years evaluations have been conducted at each agency using and/or supplying data processing services. Much emphasis was placed upon the security of the actual physical site and the equipment asset therein. As a matter of course within these evaluations, facilities were inspected and critiqued regarding access and security, smoke and fire detection/extinguishing capability, water detection, and procedures in case of emergency. Adequacy of these facilities varied immensely, from the unacceptable to very fine capabilities. The area where nearly all agencies failed to show adequate readiness is with disaster recovery. Due to the number of disasters, either nature or man made, that could occur in the world's environment today it would be impossible to prepare for all. It is more practical to prepare for disasters which could occur in the respective geographical area and in the specific populace. Additionally, it is even more reasonable to prepare to deter the disaster (or reduce its effect) rather than stop it and to place more emphasis on how to recover from losses incurred. It is this philosophy upon which the State has been building toward disaster recovery capability. Actions are continuing to encourage and guide agencies in preparing disaster recovery plans and to identify methods of gaining the resource to carry out these plans.

In the 1980 ADP Master Plan a policy was created that requires all agencies to create, submit and annually update by March 1, a disaster recovery plan. The Division of ADP has developed and published a sample plan and guide to assist agencies in the planning effort. Appendix I includes that document.

Data Communications

Many improvements in the use of data communications occurred during 1981 across many areas of the State. The most significant improvements being along the front range, and a first level Telpak circuit linking Denver to Grand Junction and many points in between. Improvements primarily involved the use of Telpak circuits (a service offered by Mt. Bell for the leasing of wideband channels between two points) through which the State has been able to realize thousands of dollars savings as well as obtaining, at no increase in cost, additional circuits needed to satisfy overloaded circuit demands. Though the building and refining of the State's data communication network will continue, many obstacles must be overcome.

The Division of Communications current Long Range Plan addresses many of these obstacles and introduces a COLONET system that will address and include data communications. The Telpak Network currently serving the data communications needs throughout the State will not be available through Mountain Bell after March 31, 1983. Alternative capabilities must be identified, tested and implemented before the 1983 date. The cost of the Telpak Network services have been increased to such a degree that the State will require over $350,000 per year additional expenditure if we have to revert to the full current rate schedule for non-telpak leaseline circuits.

Computer Performance Evaluation

The complexities of modern data processing hardware and software require that system utilization data be collected to evaluate and control system performance. Measurement technology has been employed to collect data and develop statistics. Periodic analyses of hardware and software performance characteristics enable data center directors to more intelligently perform short and long range planning and cost control in resource utilization and allocation. The information generated can be valuable for effecting increased throughput, thus decreasing turnaround time; identifying system constraints; determining necessity for equipment augmentation or reduction; developing benchmark specifications; and many other purposes. The Division of Automated Data Processing has utilized a hardware monitor in conducting computer performance evaluations over the past several years.

The Hardware Monitor (Tesdata 1155) has been utilized very effectively, however, it is no longer supported by Tesdata. Replacement parts are scarce and maintenance must be performed from within the Division. It is imperative that new monitoring equipment be procured in order to continue to reap the benefits of this function.

Privacy and Security of Information

The sensitivity of certain types of data has been recognized for many years. Concurrently the data recognition, definition, and protection was attempted with varying and many times inconclusive results. Statutorily, protection and use of sensitivity information is outlined in Part 2 of Article 72 of Title 24, CRS 1973 amended which deals with Public Records and in Article 5.5 of Title 18, CRS 1973 (1979 Supp.) dealing with Computer Crimes as a part of the Colorado Criminal Code. Policy Statements and Standards have been published by the Division of Automated Data Processing covering ADP Security and Public Records Access as a part of the ADP Management Manual.

Additionally, many agencies have published rules and regulations defining use, dissemination, and protective measures. It is undetermined at this point whether or not the publications and statutes are sufficient, however, the foundation for privacy and security is cast.

With respect to actual methods and techniques for protection and judicious use of data, the burden rests solely upon each agency through the respective "custodian". Data encryption/validation is encouraged when conditions warrant. Currently the State is in the evolutionary process of utilizing the data base management approach to Privacy Act compliance.

Computer Resource Sharing

The sharing of computer resources is by no means new to Colorado in that the ADP Master Plan has advocated this for years. The real beauty of this is that it has been occurring and is becoming the accepted practice among and within agencies. Included in the repertoire of shared systems are those of reasonably significant impact, such as:

Accounting (Non-Higher Ed.)
Accounting (Higher Ed.)
Payroll
Personnel
Motor Vehicle

The Colorado Management Information System (CMIS) is an example of the continuing efforts to reduce costs while increasing utility and cooperative data sharing. The initial phase of CMIS development is complete with the project now in the second phase.

Volume III of the 1982 ADP Master Plan is an inventory of the applications currently being processed by each Department, with a brief description of the application. Agencies anticipating the need for a particular automated system would find it helpful to investigate the existance of a similar application already being used by another agency.

Higher Education

In 1981 the appropriation process for Higher Education institutions was changed dramatically as far as the ADP activities are concerned. No longer is there line item appropriation for ADP services and equipment.

This change appears to have had little effect on the spending habits within most institutions with regard to the ADP functions. This system of appropriation allows each institution much greater flexibility in how they allocate their resources. No change is anticipated in the budget or the reporting process.

The planning process continues to move forward for the Higher Education community. Although the above change in the appropriation process caused a slowdown in planning while Institutions studied its effects, efforts are still being applied to an attempt at formula budgeting for ADP instructional activities. Planning efforts in other areas include a cooperative study of consolidation of ADP activities at Auraria, development of a viable network for library activities and a common cataloging system, and sharing of common administrative systems when existing applications become obsolete or inefficient.

The program to provide data processors and users from all Institutions access to each others ideas, successes, failures and problems has been implemented with great success. Institutions are sharing application software rather than going it alone.

Word Processing and the Automated Office

It is the policy of the Division of Automated Data Processing that words are data and text is information and that word processing equipment, staff, and systems which automate the collection, manipulation, and distribution of such information fall within the scope of the Division of ADP's statutory responsibility.

Word processing equipment will be acquired through the same process as any other type of data processing equipment by submitting an authorized ADP Equipment Transaction Request and following the normal Purchasing rules and regulations.

In order to minimize the time spent on individual equipment requests for the word processing and/or automated office functions, the Division of ADP conducted an indepth evaluation of proposals of responding vendors to a request for hardware and software to meet various levels of needs. In fact, four separate awards were made, one of which should be appropriate for any agencies level of need. The purpose of first the study, and then the Request for Proposal was an attempt to assure compatability with existing computer equipment where other than stand alone systems are needed, and to attempt to set basic standards to allow for subsequent integration or compatability.

Agencies requesting equipment for the word processing or automated office functions will procure such equipment from those selected. If for some reason the equipment selected in this process will not meet the realistic needs of an agency, they will be given approval to rebid.

SECTION II

TRENDS AND EMERGING ISSUES

Impact of Technological Evolution

In modern electronics, the desire to produce smaller components with greater versatility has always existed. Though substantial progress had been made it was not until the mid 1950's that real emphasis was applied with resultant breakthroughs. Since that time billions of dollars have been expended by private industry, universities, and the U.S. Government in search of new materials and methods to further reduce component size and weight while increasing capability. Tremendous success has been achieved as can be witnessed by observing the numerous and powerful micro-electronic devices on the market today. Through silicon crystal techniques, optical lithography, and microcircuit design memory "chips" today are extremely small and contain the equivalent of 10,000 transistors whereas a decade ago larger chips contained about 10 transistors. With this in mind consider the major mainframe improvements such as smaller floor area needed, less weight, substantially less electrical power and air conditioning capacity required, processing speeds increased to a level greater than 15 million instructions per second, superb reliability, and cost/performance increases in the magnitudes.

In the foreseeable future some very exciting events will take place which will make available to the marketplace extremely sophisticated equipment. As has been discussed, the effective component density of micro-electronic chips is very high; therefore, surface area must be utilized to the minutest degree. In Very Large Scale Integration (VLSI) it is absolutely necessary that circuit chips contain very narrow pathways along which electron impulses flow. Within industry the current definition of narrow pathway is about 3 microns. Two most prominent methods of creating these pathways is through X-ray and electron beam lithographs. At least one manufacturer has several generations of in-house designed electron beams (E Beam) with a demonstrated capability of producing .01 micron pathways.

Another emerging technology will have a purported capability to exhibit internal speeds 50 times greater than our current "fast" systems. This technology is termed Josephson Junction Logic (JJL), using submicron junctions created by E Beam lithographs on carefully laminated silicon. The circuitry will become operative when immersed in a liquid helium bath. This technology is expected to foster a new generation of computer, in the 1980's which may have 32K bytes cache memory and 16M bytes main memory in a single 6 inch cube.

These facts tend to challenge the economy of scale premise upon which the large centralized data processing facility was based. Ten years ago, acquiring a large computer and a centralized data center resulted in a computer capacity increase disproportionate to the price. It has been demonstrated that the price/performance of small computer systems now is equal to or better than the price performance ratios of new large installations. Considering all the facts clearly indicates that long range computer planning as we know it today may undergo drastic philosophical changes in the future.

There are several areas, other than mainframes, where technological advances will occur, allowing great potential cost/performance benefits to be realized.

- Microprocessors are becoming the very foundation of the emerging word processing industry. These developments, which point to the automated office, are generally applications untouched by central computer systems but which no doubt will relieve some of the reliance and demand on central systems.

- They will also play a prominent role as intelligent terminals and increase terminal capabilities of editing, decision making, error correction, etc., with little increase (if any) in physical dimensions.

- Data communications in the Denver metropolitan area is being enhanced through the availability of Digital Data System (DDS) equipment. A comprehensive State Communication Plan that offers encouraging alternatives to the high cost of data communications is also available. Though this is just beginning to penetrate the needs of State Government, DDS offers a great reduction in cost as usage warrants. Developments across the industry may include optical fiber with laser data transmission systems. Optical fiber demands particular attention as it may be an alternative to copper conductor transmission lines which are easily susceptible to error introduced by changing weather conditions.

- In the past decade, disk storage capacities have increased from 10 million to more than 600 million characters per removeable pack. Access time to the data has been shortened and the cost per stored character has shown dramatic reduction.

With the emerging introduction of new technology surrounding the design, manufacture, and use of silicon chips, we can reasonably expect main memory mass storage to emerge as a very responsive and economical alternative to the traditional mass storage techniques.

Very soon, technology is expected in the marketplace which will allow "communal" data bases. That is, mass storage data bases can be such that access will be possible concurrently by mainframes of different vendors using different protocols.

Pathways for the Future

The future of data processing within the State government holds the promise of adventure and success if proper planning and preparations take place now. Certainly we can expect to deploy resources in the appropriate areas where greatest benefit can be anticipated. This will require acquisition and efficient utilization of the most recent technology as it becomes available.

The following paragraphs contain direction as to the areas of focus and intentions of the statewide planning effort both in the coming years. They are displayed here as an overview.

Data Entry

Data Entry plays a major role in the conducting of State business from nearly every aspect. The bulk of data entry is currently conducted in the Denver metropolitan area. The replacement, upgrading, and/or enhancement of current equipment will take place using the newest technology available. Although an effort is underway to direct the responsibility of this function towards the end user's, the need for large, high volume data collection centers will remain during the next few years. With current technology, this function can be effectively performed outside the Denver Metropolitan area.

Office Automation

Word processing philosophies and equipment have been utilized in the industry for about a decade to help meet informational needs through the automating, on a small scale, of functions in the office. In the past two or three years these capabilities have crept into use by State agencies. Enough usage has occurred to lead us to realize there is a great future for more of this type of support in the new approach termed "Automated Office". As Appendix D states, much effort will be directed toward the goal of making Automated Office a reality within State Government.

Data Communications

In coordination with the Division of Communications and the use of appropriate existing facilities, accommodate the growth needs of data communications across the State.

Shared Systems

It has been recognized for several years that great advantages could be realized through shared software and shared data. In some areas and among some agencies in the State shared software has become a reality. The State intends to increase the number and usage of shared systems and to provide methods by which appropriate data can also be shared. Access to and management of this data is expected to come through software employing the newest proven philosophies in software programming and in new technology hardware allowing access from a multi-vendor mainframe environment.

Training

In order to keep up with the rapidly changing technology the State intends to increase the amount of resources being applied to the training of both ADP professionals and ADP management. Training seminars will be planned and coordinated by the Division of ADP.

Cost Recovery

Each computer center should be provided with hardware and software of contemporary technology and sufficient personnel appropriately trained. Appropriate amortization schedules for each computer center should be established. Billing rates for the computation of charges to users should be determined fairly using fully-absorbed cost accounting techniques approved by the Director of ADP and the State Controller.

Integrated Systems

During the next several years, various agencies will want more integrated systems, common-use systems, and data bases with multi-agency, multi-application purposes. Wherever feasible, the processing of applications that can be integrated will be done by a single computer center. Each computer center management should prepare for the future of integrated systems by strengthening its personnel training, by enhancing its data base management capabilities and by planning its data communications network.

Shared Facilities

Funding constraints to support ADP should be expected. In order to cope with this constraint there should be an increased appreciation of the production objectives, capabilities, and limitations within all segments of the ADP community. That knowledge should elicit the cooperation for reciprocal services. Facilities should be shared in order to accommodate peak workloads, to avoid excessive procurement, and to avoid duplication of effort and of capabilities.

Application Planning

Short-term and immediate needs are expressed as requests for specific resources, applications or systems. The requests originate with a department, institution, or agency that: one, represents the user or, two, is responsible for providing computer services. The user should originate requests for: applications, remote operations (personnel, equipment and software), and personnel for applications systems analysis and programming. Computer centers should initiate requests for supporting services' facilities, hardware, software and personnel for their operation. Each request must be justified based upon the life-cycle of the applications and the life-cycle of the resources required to service the applications. Alternative solutions to meet the need, and an economic evaluation of these alternatives should be part of the justification.

Application Development

As with the collection and entry of data, the responsibility for application development should also continue to move towards the users of the systems. Users must become more involved and more responsible in the development process to insure the requirements are being identified and satisfied. Professional data processing programmers and analysts are becoming more and more in demand and therefore, less and less available to continually modify or revise "finished products".

Recognizing the shortage of programming professionals, the vendors are developing more user "friendly" languages which have the potential of making "programmers" out of users. The State intends to evaluate the resource impact of this type of development language on existing hardware capabilities. Users or potential users of ADP are encouraged to acquaint themselves with this new technology.

Conclusion

There are numerous challenges, issues and demands the State must be prepared to deal with in the future. Specifically information needs in areas of management, scholastics, business and public relations/services must be addressed. In order to address these and other future information requirements, the State intends to continue to pursue and effectively utilize new technologies and techniques. In addition, sharing of systems and data will continue to be encouraged whenever appropriate and feasible.

SECTION III

APPENDIX A

AGENCY AND COMPUTER CENTER ADP PLANS

Introduction

In the past, each agency planned, almost independently, for its own ADP support. More coordinated planning among an agency and its supporting computer centers is increasingly appropriate, with the agencies and centers submitting the plans to the Division of ADP.

The Division of ADP requires an ADP plan from all departments, agencies or institutions who use or plan to use ADP resources. The agencies' plans must be received by April 1 and should contain the information indicated in the section entitled "Format for Agency Plans". If an agency's plan has not changed since the previous year, agencies are asked to submit a copy of the previous year's plan with a cover letter describing the situation. The Division of ADP then provides appropriate agency plans and coordinating instructions to the manager of each supporting center. Subsequently each supporting center is required to submit a center plan. The computer center plan should contain the information indicated in the Section entitled "Format for Computer Center Plans", and must be provided to the Division of ADP by June 15.

The objectives of the above schedule are:

1. To allow for adequate planning and dissemination of agency and computer center plans prior to preparation of budget requests.
2. To provide time to the Division of ADP to formulate the ADP Master Plan and budget recommendations for the Governor, the Office of State Planning and Budgeting and the Joint Budget Committee.

Without agency and center plans, it would be inappropriate to expect budgetary support or equipment and personnel acquisition support from the Division of ADP.

FORMAT FOR AGENCY PLANS

SECTION I: Management Summary

SECTION II: Current Status

- Description of current applications by: supporting State computer center, on-site processor, or contract support facilities.

- FTE requirements for maintenance (to keep applications running)

- o Description of current data communication requirements.
- o Problems

SECTION III: Planned Enhancements to Current Applications

- o Description and justification
- o Estimated transaction volume change
- o Description of reports to be added/deleted
- o Resource requirements
  - oo FTE to design/program changes
  - oo Other (i.e., purchased software, etc.)
  - oo Additional file storage requirements
- o Estimated affect on current data communication requirements
- o Recommendations to State Computer Centers to provide for the planned enhancements

SECTION IV. Planned New and/or Replacement Applications

- o Description and justification
- o Schedule/dates
  - oo Development
  - oo Test
  - oo Operational

- o Resource requirements
    - oo FTE to design/program, etc.
    - oo Other (i.e., purchased software, etc.)
- o Estimated transaction volume
- o Estimated file storage requirements
- o Recommendations to supporting computing activity

SECTION V: Resource Requirements

- o Personnel
    1. An organizational chart of the agency's ADP function showing numbers of personnel by job classification.
    2. New requirements that will be requested in next budget request.
    3. Special education or training required.
    4. Projected requirements (beyond the next budget request) and the estimated fiscal years of the requirements.
- o Hardware
    1. Additional on-site equipment (including terminals) to be requested in the agency's next budget request, and justification.
    2. Recommended additions that might be budgeted by computer centers for support of the agency. (NOTE: No list of current equipment is required if the agency has reviewed and updated the inventory provided by the Division of ADP.)

- o Software
  1. Software required but not available to the agency either on-site or at the supporting computer. Location(s) where the software is required.
- o Communications
  1. Additional or changing communication lines and modem requirements.
- o Other Special Requirements

SECTION VI: Benefits

- o A description of the benefits, savings, and cost avoidance that are to be realized as a result of implementing this agency plan.

SECTION VII: Other Recommendations

- o Any specific recommendations to the Division of ADP or supporting computer centers that may improve the agency's ADP function or support of the agency.

FORMAT FOR COMPUTER CENTER PLANS

SECTION I: Management Summary

SECTION II: Current Status

- o Description of current applications, by agency, that are supported by the center
- o Current equipment inventory
- o Current utilization (Use illustration shown in Section VI, page
- o Current data communications schematic(s)
- o Problems

SECTION III: Workload

- Applications, by agency, requiring additional support
- Other enhancements required that are not related directly to a specific application; e.g., normal growth, technological change, etc.
- Impact on resources

SECTION IV: Short-term (priority) Requirements

- Agencies and their applications that justify the priority

SECTION V: Resource Requirements

- Personnel
    1. An organization chart of the computer center showing the number of personnel by job classification.
    2. New requirements that will be requested in next budget request.
    3. Special education or training required.
- Hardware
    1. Additional equipment (including terminals) to be requested in next budget request, and justification.
- Software
    1. Recommended software changes.
- Communications
    1. Additional or changing communications lines and modems.

- Facilities
  1. Comments on adequacy of existing facilities
  2. Recommended changes
- Other resources

SECTION VI: Hardware Utilization

The current and projected utilization of computer resources should be shown for the current and each future year covered by the plan. Include resource requirements for:

1. Current needs
2. Anticipated growth (volume)
3. New and revised applications

All requirements are measured against existing capacity for each resource shown. Resources should include such components as: CPU cycles, disk storage capability, memory capacity, and channel availability.

The following chart should be completed for each of the five planning or projected years. The chart is an example of the resources which should be included. The resources which should be included will vary depending upon computer configurations and applications.

DESCRIPTION	CPU	MEMORY	DISK ACCESS CHANNEL 1	DISK STORAGE	TAPE ACCESS CHANNEL 2	PRINTER
Current	75	100	80	160	50	50
Growth	10	10	20	30	0	5
New	10	10	10	10	0	5
TOTAL	95	120	110	200	50	60
Capacity	90	90	50	85	50	90
Excess or Deficiency	(5)	(30)	(60)	(115)	0	30

Figures are percent of full capacity

SECTION VII: Benefits

- o A description of specific benefits, savings, and cost avoidance to be sought during the budget year.

SECTION VIII: Other Recommendations

- o Any specific recommendations to the Division of ADP

AGENCIES REQUIRED TO SUBMIT ADP AGENCY PLANS

All departments, agencies, or insitutions who either currently use or plan to use atuomated data processing (including word processing) in the conduct of their business.

COMPUTER CENTERS REQUIRED TO SUBMIT ADP COMPUTER CENTER PLANS

General Government

Revenue

Administration of Justice

Labor/Employment

University of Colorado

Colorado State University

SECTION IV

APPENDIX B

APPLICATIONS AND CAPACITY PLANNING

Introduction

Data processing in Colorado involves the management of very large computers. Workload growth of the early 1970's was met by incremental hardware additions when possible. Eventually, new, more powerful computers were acquired to address teleprocessing, time sharing, and to accommodate expanding batch workload. These systems will continue to play a significant role in the 1980's and beyond.

While our data processing installations and environments are all somewhat unique, the general tendency indicates a heavy day shift workload and a lower utilization between 5:00 PM and 7:00 AM. Emphasis upon online and real time applications has contributed largely to workload and utilization imbalance.

It is common for computer system utilization to be 15% to 20% lower on second shift than first shift. A further decline in system utilization is experienced on third shift and weekends. Often, however, additional mainframe equipment is requested by data installation management to alleviate day shift processing problems.

A goal of effective and efficient use of processing resources means achieving improved productivity twenty-four hours a day, seven days a week. Responsibility rests with data center managers for shifting and controlling the workload in order to achieve greater utilization, higher productivity and associated lower unit costs relative to resource scheduling, equipment planning, policy enforcement, user interface and applications development. Managers of data center functions must share a common appreciation of a goal to improve the productivity within the bounds of current equipment levels and plan cooperatively to implement actions which shift and control current workloads to accomplish this end.

Redirecting the Computer Programming Development Workload

Computer program development activities consume up to 25% of the first shift processor load at specific data centers. The repetitive steps of program modification, compiling and testing, are sometimes well suited to a time sharing solution; however, the cumulative effect competes directly with end-users for scarce first shift processing resources. Potential for abuse of interactive time sharing assisted program development is great. Terminals may promote inefficient programming habits which result in an increase in the number of compiles and tests. This easy access and availability tends to become a substitute for adequate individual preparation.

If abused, interactive programming can complicate computer scheduling and deprive operations of exercising workload leveling controls inherent in batch and remote job entry program development methods. This will cause uncontrolled competition with end user's production processing.

The following considerations must be examined.

- Management should monitor development staff to insure non-abusive use of interactive programming aids and to insure staff has adequate training and preparation.
- Encourage employee flexi-time, to redistribute necessary program development workloads to other than prime shift.
- Whenever appropriate and feasible, encourage the use of batch processing.
- Establish work standards and implement stringent controls for time sharing program development activities.

Whenever end-user production services suffer as a result of contention with time sharing development, more efficient programming habits and techniques as well as a moderate degree of control and constraint of time sharing development will be invoked by the computer center, in order to supply sufficient resources for production uses. It makes little sense to provide prime time for development of new applications at the expense of production processing on existing applications.

Central and/or Large Computer Centers

Much effort has been put into the consolidation of some of the computer centers in the Denver area during the past few years. The primary objectives of the 1977 Statewide ADP Master Plan have been successfully implemented and much improved level of service has been delivered as a result of those activities. It is necessary to continually monitor the availability and adequacy of each facility with the objective of assuring the users that sufficient resources will be available when needed. The State must develop a comprehensive approach to better plan, justify, develop, monitor and purge applications.

One method being considered as a method of assuring users of sufficient resources is to allocate service center's computer time based upon historical usage adjusted by needs resulting from approval of ADP application plans as submitted to the Division of ADP per Appendix I of this document. This and other considerations must be examined.

Distributed Data Processing (DDS)

Distributed data processing describes an approach to data processing which, although not really new, commands significant attention. DDP refers to the decentralization of computing from a single computer to multiple computers. Each computer has well-defined responsibilities and limited operational overhead. The connection of these computers, through communication links forms a network. Thus, the distributed aspect refers to communication between two or more computers in a variety of operating environments. A distributed processing network of computers, each controlling its own network of terminals while interfacing with a host processor is capable of fulfilling response and reliability requirements while providing additional data processing controls.

The selection and evaluation of alternatives for addressing a defined requirement need not be constrained by a previous association with a particular data center, or restricted to large scale computers. The wide choice of DDP alternatives available to systems designers will be evaluated primarily on the basis of cost-benefit advantages. The judicious application of concepts certainly can reduce DDP expansion of large scale computers.

Distributed system design strives to place processing and storage where it will most effectively and efficiently satisfy organizational goals. There must be recognition by management that the DDP approach is a significant departure from the current approach to data processing problem solving.

Software capabilities integrating operating systems, language processors, and multiple levels of protocols are inherent in the more complex forms of distributed processing but may not be available from most vendors. Features of desired software capabilities include, but are not limited to, standard protocols linking large scale systems, distributed systems, and terminal devices; effective software management of distributed and centralized data bases; integrated transaction software and terminal hardware; and high level language processors.

Such software capabilities from vendors will be needed to enable data base integrity and recovery in a multiple access environment; to provide up and down line loading of data and software; to facilitate remote job entry; and to enable a high degree of unattended computer operations. The implementation of a distributed system which fails to achieve any of the desired data processing technical objectives may diminish or negate expected benefits.

Stand-alone local processing systems can be viewed as a form of distributed processing, removing the communications load from already overburdened central processors. They also allow local control of job scheduling not easily attainable from centralized processing.

The use of DDP may be a natural approach for geographically dispersed organizations having unique needs. Agencies are encouraged to examine the feasibility of employing economic distributed systems capable of providing improved user services while serving to control growth of large scale systems and centralized data centers. The economies of distributed approaches will dictate future directions in this regard.

Management of Processing Performance

Our goal for the large system computer environment mandates deriving the absolute maximum from the equipment while minimizing the degradation of service to users. This "maximum" requires a constant workload approaching twenty-four hours day, seven days a week.

Generally, under-utilized processing resources exist primarily outside the prime shift, causing overall measured utilization to fall significantly below standards of good performance. Workload and resource management techniques must be directed toward more effective and efficient use of large scale computer system resources. Daily, weekly, and monthly performance indicators are needed to tell managers what they have been able to achieve. Reviews relating standards of performance to actual results must take place within the data center functional areas and between responsible managers, resulting in management action to devise and implement changes in resource use, scheduling procedures, workload controls, system design, workflow procedures, and planning.

A wide spectrum of tools are in place or available to assist the data processing manager in the quantification of performance indicators. Developments in hardware monitoring, and software measurement capabilities are occurring which enable practical measurement. Used in conjunction with vendor supplied job accounting systems, operational cost reports and workload profiles, these tools comprise an essential source of performance information.

Performance management planning is an ongoing cycle of measurement comparison and action continually influencing and being influenced by the data installation environment. The desire to maintain a constant operational workload must become an integral part of the performance management planning activities of each facility manager.

Workload leveling, based upon minimum and maximum processing periods during the twenty-four hour day, week, month, deserves renewed emphasis. Quota setting for second and third shift, job class restrictions, scheduling procedures, and run limits may be viewed as appropriate considerations toward this end.

The Division of ADP computer performance evaluation program makes available computer system hardware measurement and analysis services to State agencies and data centers. Quantification of computer system capabilities and limitations affecting relative performance is meant to supplement or compliment performance management activities. The objective is to provide a quantitative basis for decision making, thereby contributing to management's ability to attain organizational goals.

Conclusion

Unlimited computer resources within State government should never be expected. Management, both user and ADP, must constantly review existing automated applications and purge those which no longer serve a need. Reviews must also be made of new systems to insure the objectives of the applications are being met as perceived in the design. Although capacity planning tends to relate to the hardware and the measurement of its various components, the more important issue is the value of what is being processed, the application software, and data.

Statement of Planning Objectives

- Assure measurement capabilities are established and utilized by all data processing organizations.
- Encourage consideration of any State data installation's cost-benefit potential when seeking to satisfy processing need.
- Institute substantial billing discounts for non-prime shift workload processing.
- Employ the advantages of distributed data processing.

- Establish a method to better plan, justify, develop, monitor and purge application software.

SECTION V

APPENDIX B

DATA ENTRY

Introduction

Since 1978, agencies have been encouraged to provide for their own data capture by the installation of terminal equipment within their office confines. Not only does this reduce document handling, but it also provides faster, more responsive and proper prioritization of the keying function. Although many agencies have moved in that direction, some will always have to depend on the large data entry centers because of the high volume requirements.

Data Entry Technology

In recent years the development of new technology has given data entry shops and users many new avenues of approach in solving the problems of data entry.

a. Microprocessors of various sizes and capacities are now available.

b. The cost of terminal equipment is lower due to many more companies entering the market and mass producing the hardware, plus new technology in the field has made many improvements in both hardware and software in a short period of time.

c. New software packages that save hours of operator time in formatting and repeat functions.

d. Direct entry of data via telephone lines or mass storage devices.

Conclusions

State data entry centers are studying alternatives for location of data entry facilities, and the merging of staffs as proposed in the 1981 Plan. State-of-the-art equipment and software are necessary for some large applications. Other applications need to be reviewed and in some cases redesigned to utilize functions of new hardware and software. Where possible off-loading the smaller data entry applications back to the user level by locating the hardware where the documents originate is recommended.

Statement of Planning Objectives

- Continue main planning thrust of off-loading data entry functions to user agencies wherever possible.

- State agencies heavily involved in data entry functions will set up, monitor and enforce key stroke production standards appropriate for individual applications and environments.

- Continue to evaluate and select outside (private industry) data entry support as a cost effective alternative for overload requirements.

SECTION VI

APPENDIX D

WORD PROCESSING AND AUTOMATED OFFICE

Introduction

During the past ten years, computer technology has ushered in "revolutions" of minicomputers and microcomputers, data base management and total management information systems (MIS), distributed processing, distributed data bases and structure programming. Now the "revolution" of the office automation is here. Office automation is an old term with a new meaning. Twenty years ago office tasks like payroll, accounting and purchasing were automated. These well structured high-volume tasks were ideal for the technology of the time. In the present reincarnation, office automation refers to the application of computer and communications technology, systems science and behavioral science to the less structured office functions. In both "revolutions" the objective is to improve the productivity of the office labor force. Actually the rate at which the technology will and should be integrated into organizations will be evolutionary. Much thought should go into the change before it is begun.

Improve Production

Many studies performed during the last few years in the United States, indicate an annual increase in office labor costs of over 6%. At the same time computer costs are decreasing at 25% per year, communications costs declined about 11% a year, and computer storage costs have decreased at a rate of 40% per year. The result has been an increase in office staff costs from about 20-30% of the total to 40-50%. (Harvard Business Review (Donovan J. and McInick S. 1977).

Word processing is an initial attempt to improve clerical productivity and thus reduce that cost.

Richard Nolan, in his publication, Managing the Four States of ADP Growth, suggests that organizations move through four stages of growth as its use of information systems mature. The four stages; initiation, expansion, formalization and maturity, appear to be appropriate for office automation as well. The initiation phase or stage of office automation is probably limited to some form of word processing or text editing. This involves the use of either standalone word processing equipment, shared logic systems, or text editing systems on large central processors, with emphasis on efficient paper production and little or no interest by data processing managers or staff.

The expansion stage follows. This expansion is what we call the office of the future or office automation. The objective will be to replace paper with electronic information, by mechanizing such things as the in basket, file cabinet, manager's calendar or the telephone. Since this phase will emphasize the mechanization of tools and not the function, little integration of the tools will be seen. This expansion, if not properly administered and managed, will bring large amounts of distributed hardware. For such things as electronic mail, it is imperative that good planning at the early stages must be done in order to assure compatibility of software, hardware and communications resources. As more and more agencies begin to use these systems, we will have to address the organizational problems which will be greater than the technical challenges.

The formalization stage begins when the users become comfortable with the use of the disjointed tools acquired and implemented in the expansion stage. What is being done in the office will become important and thus the integration of applications and facilities into cohesive systems will transpire. Complete reviews of the total office operation will be made and the whole function rather than the tasks will be automated. This will enable office staff to address other critically neglected tasks and assignments.

The last stage, or maturity period, of the growth process is a period of stabilization, review, evaluation and the revisiting of the status of new technological developments.

The length of the cycle and the evolution through the four stages depends upon how much effort is put into analyzing and understanding the office processes and how they can be improved.

Conclusion

Office automation will evolve from a focus on task mechanization such as word processing to a focus on functions or process automation. Consideration of the processes in the office must be kept in focus throughout the total cycle. In the execution of the planning objectives for last year, the State has prepared, and distributed Request for Proposals (RFP) to vendors and has evaluated the proposals received. Awards have been made on four levels of hardware/software capability which will provide for the vast majority of the needs of State agencies. The four levels are: (1) Non-Integrated Single Workstation word processing; (2) Non-Integrated Small Cluster, up to four workstations, two printer configurations, (3) Non-Integrated Large Cluster, up to ten workstations, five printer configurations; and (4) an Integrated system that provides for networking any of the above three systems.

All four levels have data communication capability to large central processors. These awards will be available to all State agencies and institutions for up to three years.

Statement of Planning Objectives

- Assure that proper cost/benefit analysis has been made before any acquisition of word processing equipment.
- Encourage agencies to take advantages of the State award rather then spending already scarce personnel resources re-evaluating proposals because of minor requirement differences.
- Encourage agencies to evaluate total office needs based upon current and future processes or functions.

SECTION VII

APPENDIX E

STATUS OF STATEWIDE DATA COMMUNICATIONS

Introduction

As the State continues to expand its use of computers in all State agencies and institutions, the development of a single statewide network becomes more and more vital. Currently, the individual agency computer networks serves over two thousand terminals. Today those networks have their own independent circuit arrangements and terminals to service their users. Very few of these terminals share communication circuits or can access more than one State computer center.

Private circuit facilities are utilized for both voice and data requirements and have been acquired on a gradual basis by Colorado State agencies. These facilities have been provided primarily by Mountain Bell Telephone Company and to a lesser extent by the Division of Communications utilizing State Microwave channels.

Certain State agencies utilizing Mountain Bell facilities were able to obtain State or Federal Telpak circuit facilities, thus obtaining lower mileage cost for part or all of their circuit requirements. During the past two years, the State Telpak facilities were greatly expanded, thus providing State agencies lower mileage cost for their circuits. Since the development of the State Telpak facility, it has expanded to where comparable service provided by normal tariff arrangements would be an additional $365,000 annual cost. ($1,000 per day)

In the 1981 ADP Master Plan, a list of users and detail cost data was furnished. The routing of these State Telpak facilities as well as the cities served are defined on the following page. During the past year, the Division of Automated Data Processing established an automated inventory of circuit allocations and a billing system in order to better control and facilitate ease of recovering Telpak cost.

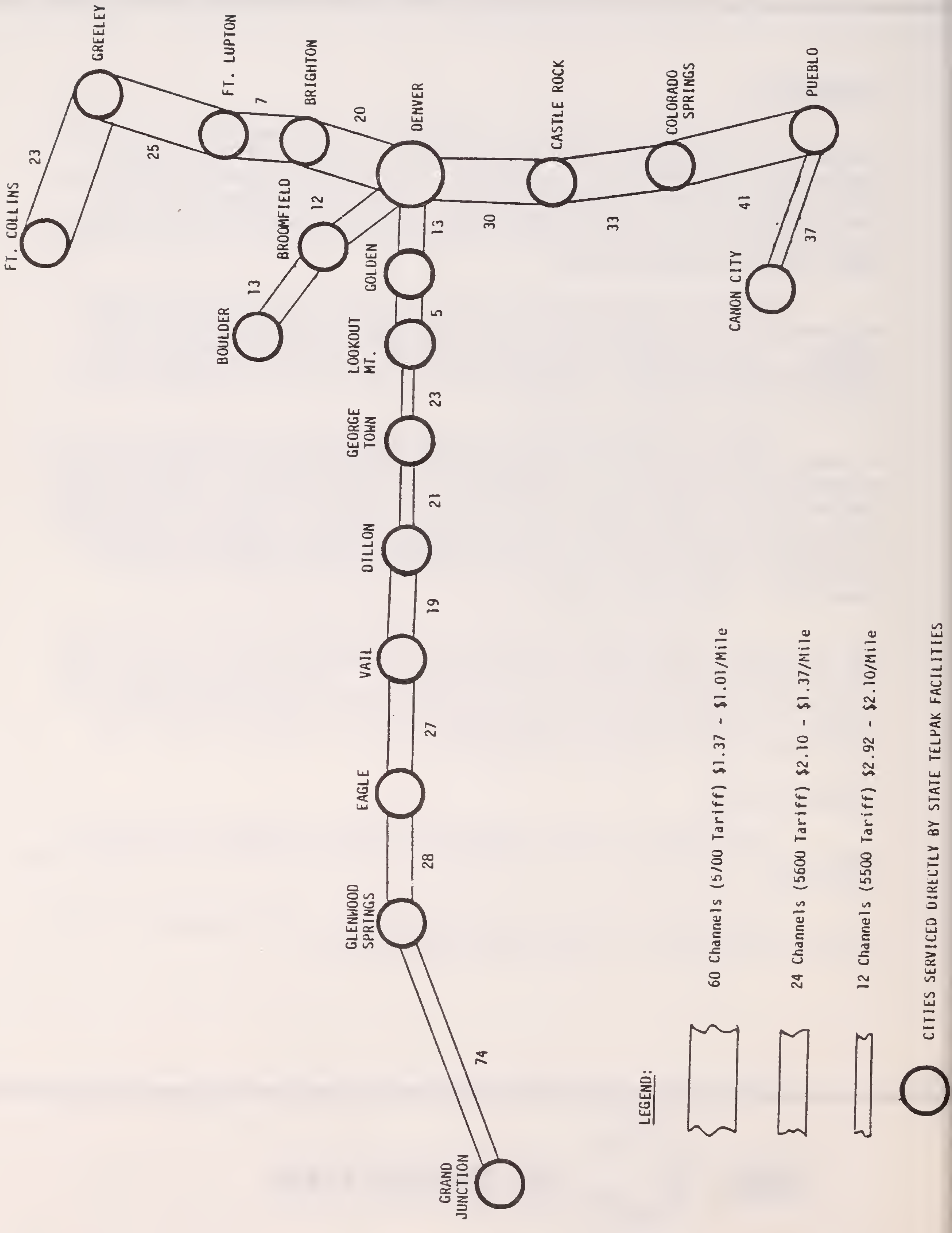
Future of Telpak

On December 19, 1980, Mountain Bell sent a proposal to the State Public Utilities Commission, requesting the discontinuation of the Telpak type facilities.

As a result of this action, Mountain Bell, the Department of Administration and the P.U.C. stipulated and agreed that:

STATE OF COLORADO
TELPAK FACILITIES

OCTOBER '81



Series 5000 Channels (TELPAK) are allowed to be discontinued as a service offering to new customers.

Existing customers may keep service and add or delete channels within the limits of present base capacity, or change from one base capacity to another.

Series 5000 Channels shall not be used for any purpose for which a payment or other compensation shall be received by either the customer or any authorized or joint user, or in the collection, transmission, or delivery of any communication for others. Customers and authorized joint users are not prohibited by this provision in sharing the cost of the Series 5000 Channels.

Series 5000 Channels will be discontinued on April 1, 1983, as a service offered to existing customers as of the date of this decision.

The existing rates for Series 5000 Channels will remain in effect until the service offering is discontinued on April 1, 1983.

The tariff sheet accompanying Advice Letter No. 1692, filed on March 13, 1981, be permanently suspended as of the date of this Order.

Mountain States Telephone and Telegraph Company be, and hereby is, authorized to file new tariff sheets accompanied by a new advice letter implementing the effect of this Order, said tariff and advice letter to be effective upon one (1) day's notice.

Policy on Use of State Telpak Facilities

Between now and April 1983 the State will continue to use and expand this cost effective facility.

The State Telpak facilities are intended to provide reasonable circuit facilities for either voice or data requirements. These facilities can be provided to either State or non-State governmental agencies. Each request from non-State governmental agencies for such facilities will be reviewed on an individual basis. Such requests must be sent to the State Division of Communications in writing providing the following information:

1. Specific circuit requirements must be defined, including characteristics of the circuits needed, cities in which terminations are needed and a diagram or geographic map of circuit routing.
2. The intended use of the circuit must be indicated (i.e., specific program effort, from general voice needs to specific applications when data circuits are involved).
3. Specific customers utilizing the requested circuit facilities must be clearly identified, including each customer's name, organizational unit and termination location.

The Division may be contacted as follows:

Director, Division of Communications
2452 West 2nd Avenue
Denver, Colorado 80223
Phone 866-2341

Approach to Statewide Data Communications

The approach to statewide data communications is the sharing of resource and group acquisition of communication facilities. This will allow State agencies to acquire the lowest possible unit cost for data communication facilities by the bulk lease of facilities and sharing of such facilities through the use of evolving network equipment and related software techniques.

The bulk lease of facilities has been achieved by the acquisition of State Telpak facilities. The sharing of communications facilities through the use of network equipment and software is slowly evolving from a number of different vendors. A number of vendors have developed or have under development, methods to share communication facilities, utilizing their own computer and terminal equipment. However, few vendors have developed sharing methods that can utilize foreign vendors equipment. Initial investigation has shown that sharing of communication facilities in a multiple vendor environment is still under extensive development and that the equipment is expensive to acquire and maintain.

Since the State has historically acquired equipment under the competitive bid process, a great variety of terminal equipment is in use with the various State computer centers. These independent acquisitions of data communication networks make the sharing of data communication facilities an extremely difficult task.

Some of the State's equipment has been purchased and much has been leased over a period of time accruing credit which can be applied toward purchase.

With the possible loss of the State's purchased terminals as a result of their inability to utilize shared communications facilities, the cost of replacement terminals together with the cost of network equipment and software may offset the savings acquired by the sharing of communication facilities.

Evolving Technologies and their effect on Statewide Data Communications

New concepts in data communications are continually evolving; many of these concepts have not been fully developed, some have not been tested fully in a practical environment, while others do not provide a cost effective situation that would make their products advantageous for the State to implement. No vendor has under development a large percentage of the new data communication concepts. The State must take the position to continually review newly released products and prices associated with various data communication products.

Certain data communication products are of more interest to the State in their potential impact than others. Some of these products are defined in the following narration and a brief explanation of how the State views these products in providing a means of fulfilling the Data Communications objectives.

1. Integrated Networks - A number of vendors are working on techniques that will allow the combining of data, voice, facsimile, electronic mail, teleconferencing and other types of endeavors that allow communication activities to function through common facilities. Several vendors are developing PBX systems which will have sophisticated processors and software to handle such functions. Other vendors providing satellite techniques are developing distributed networks with capabilities for digitized voice, facsimile, data, word processing and other requirements through a common satellite facility. Integrated and homogeneous network techniques, if developed properly, could allow the State to better use common communication facilities. This would be especially true if higher bandwidth digital channels could be obtained to terminal users sites.

2. Small Dish Satellite Service - Small dish antenna (3 meter dish) digital services utilizing satellite services are being made available by two satellite service companies. These services are provided at transmission speeds ranging from 9.6 to 56.0 Kbps allowing digitized transmission of digitized voice, facsimile and data. These low speed satellite transmission services are currently cost-effective at the 1,500 to 2,000 miles distances and are servicing major population centers. Such small dish satellite services are expected to become more cost effective as antenna dishes become smaller. Small dish satellite service is expected to become cost competitive with current land circuit facilities and be made available into remote areas of the country. Colorado State government will continually monitor the availability of such services. The hope is that eventually better cost and performance will be provided from such service companies, especially with the longer distance intra State channels.

3. Hybrid Packet and Circuit Switching - Several vendors have developed and are continuing to enhance data network switching techniques. Most of these vendors utilize a technique which utilizes nodal processors and Time Division Multiplexors to provide a variety of switching techniques. Such switching techniques are used primarily for data purposes and are implemented in several States. Such a technique allows for the sharing of communications and is under consideration as an alternative for data network. There is some question on the cost-benefit of such systems, but this is expected to improve as more competition occurs and prices decrease.

4. Fiber Optics - The technology of fiber optics is one of the most exciting and promising communication technologies because fiber optics can provide a virtually unlimited data handling capacity. Such technology is currently under test by the Bell Systems and has a high potential for use in future Bell land base communication facilities. Such technologies are available today from other vendors in installing local networks and could be installed in various large State building complexes.

Only an extensive study will clarify cost advantages or disadvantages. Eventually, as terminal equipment becomes old and not maintainable and vendors perfect network techniques, the sharing of communication facilities will evolve.

State Communications Plan

The Division of Communications has published a five year Statewide Communications plan which proposes the development of a Colorado Communications Network.

Recognizing the problems that have surfaced because of the discontinuance of TELPAK, the plan provides a timely alternative for data communications. During the next 15 months, the Divisions of ADP and Communications will be actively pursuing the development of the States own "TELPAK" capability by utilizing the current State facilities and adding those facilities necessary to continue cost effective service.

Conclusions

Data processing and communications is at the center of automated systems being installed throughout the State. The ability to capture information in electronic form and retrieve such information in an appropriate media and format, is a continuing requirement. The State will investigate and determine the best short and long range alternatives for data communications which will take advantage of communication equipment and facilities.

Statement of Planning Objectives

- Satisfy data communication requirements through the use of shared facilities wherever feasible.
- Implement an alternative for TELPAK by March, 1983.
- Encourage all agencies to assist in the implementation of the Colorado Communications Network.
- Concentrate financial resources toward the facilities needed to implement the Colorado Communications Network.
- Examine and inventory data communication equipment and network arrangements to understand commonality of equipment and network routing arrangements.
- Determine common routing arrangements that will best service the majority of State agencies.

SECTION VIII

APPENDIX F

ADP/COMPUTING PERFORMANCE EVALUATIONS

Introduction

The purpose of the Performance Evaluation is to provide the Governor, Legislature, Executive and Data Processing Management with an objective assessment of the data processing function in the State of Colorado and the methods by which agencies plan to meet the management/user needs for future information.

In the past, the Division has attempted to encompass all aspects of the data processing function from data entry through the development of systems and the operation and utilization of equipment and facilities.

Systems/Applications Review

During the past few years a stronger emphasis for a detailed review of systems/applications has been desired by the Legislature, executive management and users of the various systems/applications. Many of the State of Colorado's systems/applications are in need of refurbishment, revision, modification or replacement. This can be attributed to the fact that most currently used applications were designed for card-oriented first or second generation computers, one-for-one converted to third generation computers, and as a result very few of the converted applications have taken advantage of the current computer technology.

Consequently, the cost to maintain applications is estimated to be from 50 percent to 75 percent of the professional staff. This results in a situation where the manager, computing professional and users believe that the solution to this problem is to continue to solve the problems by acquiring even more computer hardware, while increasing the ADP staffs to maintain the ongoing applications and develop new ones. On the other hand, dated, obsolete or inefficient applications which consume large amounts of computing resources can be identified, examined and determination made as to the best overall alternative based on cost/performance.

Computer System Hardware Monitor Evaluations

Hardware monitoring is based on the fact that most performance characteristics of computer systems can be measured directly from signal voltage transitions in the digital circuitry of the hardware. Hardware monitors, therefore, use probes, or sensors, for detecting changes of state in digital signals, logic for combining related signals, a storage facility for accumulating signal changes over extended period of time (counters or distributive memory), and some means of recording accumulated data for later reduction and analysis (tape, printer, CRT or disk).

The three basic types of hardware signals that can be monitored are status, basic and encoded. Status signals vary directly with a function to be measured. For example, the state of one specific control signal in a given computer, corresponds directly to the activity of the CPU. When the signal voltage is high with respect to some common reference voltage, the CPU is in a wait state; when the signal is low, the CPU is actively executing instructions. A sensor attached to a mainframe test point for this signal will transmit voltage levels back to an electronic counter in the monitoring device, which in turn accumulates the elapsed time the signal spends in either of its two states.

Signals that must be combined to define some functional computer measurement are known as basic signals. Often computer activity must be inferred from a combination of machine signals with no intrinsic significance of their own. For example, channel activity does not exist as a meaningful function in the digital circuitry of a Univac 1108 system. But "input data request" and "output data request" do. Since the sum of these two operations is equivalent to the analysts category of "data words transferred" the measurement may be made by counting the number of times either signal pulses. This is done by patching both signals into a logical "OR" gate and its output to a hardware counter. As the above examples imply, most hardware counters are equipped either to count pulses or to time signal duration, and most monitors include patch panel logic to perform simple gating operations on incoming signals to develop the desired measurements.

Finally, there are many signals in the computer that have meaning or function only in relation to other signals, that is, as part of a binary encoded string. Accordingly these are called "encoded signals" and must be monitored as a logical cluster. An isolated bit in a machine address register, for example, has little meaning without knowledge of the status of the remaining bits. The second bit in a four-bit string representing the protect key of a task currently in control of the CPU makes sense only in terms of the coding scheme of which it is a part. The same is true of data signals on buss lines, unit identifiers, and many other important matching signals. The class of signals is, in fact, the link between hardware and software functions in the computer. The software communicates with the hardware through binary encoded messages that activate appropriate logic gates and circuits in the hardware. Monitoring these encoded signals in the hardware thus creates a window between the physical and the logical environment of the system.

Measurement based on encoded signals are particularly powerful because they approach real task identification. Specific problem programs and data files, especially, become visible through internal machine registar settings. Such measurements exceed the capability of monitors equipped only with hardware counters. They demand many additional sensors, logic gates, and a sophisticated data collection capability. More specifically, they require a distributive memory (or "distributor") large enough to support a significant sampling rate for high speed computer events. It is on the ability or inability to capture encoded signals that state-of-the-art hardware monitors have come to be judged.

The State purchased a Tesdata 1155-B Hardware Monitor in June, 1974. This Hardware Monitor has the ability to capture status, basic and encoded signals. It has 96 sensors, 960 plug board links, 32 controls, 1600 BPI magnetic tape unit, 8 KB of memory, 30 nanosecond pulse width sensitivity, 15 megahertz signal repetition rate, and a distributor large enough to sample high-speed computer events.

Since the acquisition of the Tesdata Hardware Monitor the State now has available a tool which can be used to scientifically evaluate computer performance. The Hardware Monitor has been used to evaluate State agency computer equipment upgrades, to identify system bottlenecks, to measure central processor and/or channel utilization characteristics and systems timing.

Conclusions

The hardware monitor is no longer supported by the Tesdata Corporation. During the past year the State has performed all maintenance and repairs. Parts are becoming difficult to find. The Nano/Pico second speeds of current processor are faster than the monitor can detect and capture. A state-of-the-art computer hardware monitor is badly needed. It would provide full capability for detecting, capturing and reducing encoded signals on-line, for all existing computer configurations. Moreover, superior reports may be generated from the data which is stored on magnetic disk/tape simultaneously while data is being gathered. Graphic displays of CPU/channel functions may be viewed as they occur and while data is being collected. Various computer performance evaluation reports may be rapidly generated in many summarized versions to aid the analyst in identifying problems, correcting bottlenecks and fine tuning the computer system with far less manual effort involved. This allows the analyst to spend more time in the analysis problem solving function rather than data collection and reduction phase.

The performance evaluations, special studies, and computer hardware monitor analysis have served to improve the overall ADP performance in the State.

Statement of Planning Objectives

- For the 82-83 fiscal year $30,000 has been requested for the purchase of a modern state-of-the-art computer hardware monitor, to be used for computer performance measurement and evaluation on a statewide basis.
- The Division of ADP plans to continue to perform ADP performance evaluations, special studies, computer hardware monitor analysis, follow-up studies, and systems/applications reviews to fulfill the statutory requirements as previously mentioned.
- Applications reviews will be stressed in fiscal 1982-83.

SECTION IX

APPENDIX G

DISASTER RECOVERY PLANNING

Introduction

Over the past several decades Data Processing has become such an integral part of an organization's operations that if its services were suddenly disrupted for a significant length of time the functions of that organization would be severly hampered. In fact, according to a study by the University of Minnesota Graduate School of Business Administration, on the average, following a complete data center failure, operational business activities would suffer a decline after 10 1/2 days of 91 percent.

Volumes of information exist on how to protect a data center from natural disasters, human error or intentional sabotage. Most data centers are very well protected with their Halon systems, tight security policies and software packages, however, until recently, no consideration was given to what do we do if our security measures fail and our data center is severly damaged or totally destroyed. Management has had the smug attitude that "it can never happen to me".

The number of "unexplained" fires, bomb threats and other occurrences of sabotage are on the increase. Radical groups and disgruntled employees are aware that the data center is the "Achilles heel" of most organizations.

Attitudes have been changing over the past several years. We are seeing the emergence of a number of companies that are in business to help organizations develop Disaster Recovery or Contingency Plans through seminars or on a consultant basis. Data centers are being set up to provide back-up capabilities, on contract, for centers that have been struck by a disaster. Management is coming to the realization that an "insurance policy" against the possible disruption of data processing services is necessary, thus, the increased interest in Disaster Recovery or Contingency Planning.

The State of Colorado has become so dependent on the support of Data Processing that each and every agency would have to alter at least some of their functions if the support of their computer was disrupted for any significant length of time. In fact, most of the agencies would find it very difficult, if not impossible, to revert to manual processing due to lack of manpower and training. It is just taken for granted that the computer will be there to service their needs.

Most data center managers have taken steps to safeguard their center against a disaster. Halon and alarm systems are installed in most large centers to guard against fire.

Illegal entry to the center is prevented by security guards and/or locking systems that require some form of identification for entry. Data is protected from access or destruction by software packages and hardware functions. In short an extreme amount of effort and money has been expended to protect our data processing environments from unfriendly elements but very little has been done to recover from a situation where our security efforts were futile.

The State of Colorado's data processing budget is now in excess of 40 million dollars. The loss of any one of the major centers could easily cost the State several million dollars over and above the replacement costs for the center. The data processing community has a responsibility to see that any loss is held to a minimum. A variable Disaster Recovery Plan is a good "insurance policy" toward meeting this responsibility.

Every department, agency and institution is required to develop a disaster recovery plan and submit it to the Division of ADP. Annual updates are also required by March 31.

The Division of ADP has developed a sample disaster recovery plan for agencies to follow. That sample is included on the following pages of this appendix.

STATE·OF·COLORADO
1876

DISASTER RECOVERY PLAN

STATE OF COLORADO
DISASTER RECOVERY PLAN

DATA CENTER:

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DISASTER RECOVERY PLAN DIRECTIVE

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III. Disaster Recovery Team, Data Systems Division - Executive Department organization Chart; Disaster Recovery Team Contact Information

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DATA CENTER:

1.0 The Philosophy Behind the Plan

The philosophy behind this plan is to have available current documentation within the plan and recovery file with thorough procedures to approach any disaster before or immediately following the disaster.

The plan is the strategy and flow with checklist that cover the concerns necessary to implement recovery for any level of disaster up to and including total loss of the Data Center. It can be used to assist with normal operating problems or to take action on any primary application outage determined to last hours or longer.

With the assistance of vendors (as acknowledged in formal commitments), use of this plan is intended to restore the facility's critical applications in a to timeframe. These critical applications have been defined by all user agencies and reside in the recovery file. The schedule of events within the recovery process is to have a detailed recovery plan in place within to hours, network restoration in the back-up center in to , restoration of the minimum hardware configuration in the back-up center within , complete software testing, systems testing and begin data restoration within , and start critical applicaton production by the . Page 5 of the Disaster Plan will give a more detailed picture of the recovery objectives.

Many alternatives to recovery were approached before this plan was accepted. It is necessary to use this concept of recovery because of the physical size and the changing EDP environment within the agency. This plan with its format can be easily modified and updated to meet current commitments.

The disaster plan coordinator will have the responsibility to audit all functions of the plan and the recovery team on a quarterly schedule. This information will be kept in disaster plan update schedule referred to in the Appendix X, page 9 of 9.

The plan is divided into two parts. The first part details the plan with a recovery flow to guide a recovery team through the disaster. The second part consists of the appendices providing complete details to be used in the recovery process. This information includes current data to be updated quarterly that will assist the recovery team in assessing the damage and initiating recovery.

DATA CENTER:

The recovery file will contain documentation on the Data Center and recovery site to assist the recovery team with their recovery plans. The recovery file is a major part of the recovery operation. The material in the recovery file was selected by its physical bulk, necessity to be modified, or need to be kept classified. Without this data, the recovery operation would be severly impacted. The contents list for the recovery file is Appendix X, page 9 of 9.

The complete plan and recovery file are available for audit but the information is considered confidential and will be kept in a secured file. The file will be retained by the disaster recovery coordinator and will be mobile to insure its availability to the selected recovery room.

This plan has been developed from the National Association for State Information Systems disaster recovery plan directive.

For purposes of this plan, any problem that cannot be resolved by normal operating procedures is defined as a "disaster." We feel that the Central Computer Facility has already eliminated the potential for several problems and has the ability to resolve the normal operating problems before they become disasters.

The new Central Computer Facility was planned and built to protect the EDP environment that it houses. The facility is a steel and concrete structure with smoke and fire detection systems connected to sprinkler systems. A halon system and the Fire Department.

An electrical system that includes generators and an uninterruptible power source is installed to maintain the necessary power requirements of the facility.

The security for the building consists of a team of security personnel, an electronic limited access security system, a TV monitor system and a alarm system connected to the Police Department.

The hardware is configured with multiple CPU's channels, control units, electronic switches and patch panels to improve processing. With this type of configuration, failing components can be removed from the systems for repair without impacting primary applications.

The production software and application systems are backed up on tape and secured in an off-site vault. User agency programs, JCL and data sets can be and are periodically backed up and stored by the agencies in the off-site vault. These tapes are used to restore production volumes when hardware or software failures destroy their contents.

Other damage-limiting measures have been taken as a result of the use of fire-resistant machine covers, emergency shutdown procedures that are built into the software for an orderly shutdown of the software, log tapes that can be removed during evacuation and training procedures with periodic drills. Data Center supplies are being stored at an off-site location.

The back-up site is being maintained with electrical power, coolant systems, air conditioning and a raised floor. This approach is the "empty shell" concept. A minimum system configuration to support primary applications has been designed and will be updated quarterly for the back-up site. Floor plans for the equipment have been designed and the TP network is in place for a quick conversion of lines into this back-up facility. A back-up software configuration will be maintained to support the back-up hardware configurations and will be updated and tested for any change that might affect users or operations.

This plan for restoration of the centralized Data Center is comprehensive and will allow recovery of the Center. However, it is of little value unless all agencies with critical applications have their own disaster recovery plans and critical data backed up and stored off-site.

2.0 Introduction

The Disaster Recovery Plan has the following objectives:

A. To provide a specific routine for actions, personnel assignments and back-up arrangements to assure expeditious and effective response to a disaster.

B. To establish a basis for operational planning and personnel training to assure the effectiveness of the response to any disaster befalling the Central Center Computer Facility.

C. To provide guidance for predisaster demange limiting actions when early warning is available; e.g., a flood, civil disturbance, bomb threat or tornado.

3.0 Definition

It will be up to the judgement of the Data Center Manager (or designee) to determine, first, if the Disaster Plan is to be activated and, second, if the facility is to be shut down and evacuated. In making these decisions, the estimated duration of an interruption will be the critical factor. Appropriate parts of this plan should be applied whenever there is a likelihood of a critical resource disruption of more than   hours.

A "disaster" is a lengthy disruption that seriously impacts the Data Center's ability to meet customer service commitments. It may involve reconstruction of data and processing at another site.

The term disaster includes:

- Ecological events (storms, earthquakes, floods, etc.)
- Accidents (fire, power loss, communications loss, etc.)
- Deliberate disruptions (strikes, bombs, sabotage, etc.)

A disaster does not include:

- Momentary, short-duration failures of hardware, software or utilities.
- Planned cessation of use of all or part of a system in order to take preventive corrective action

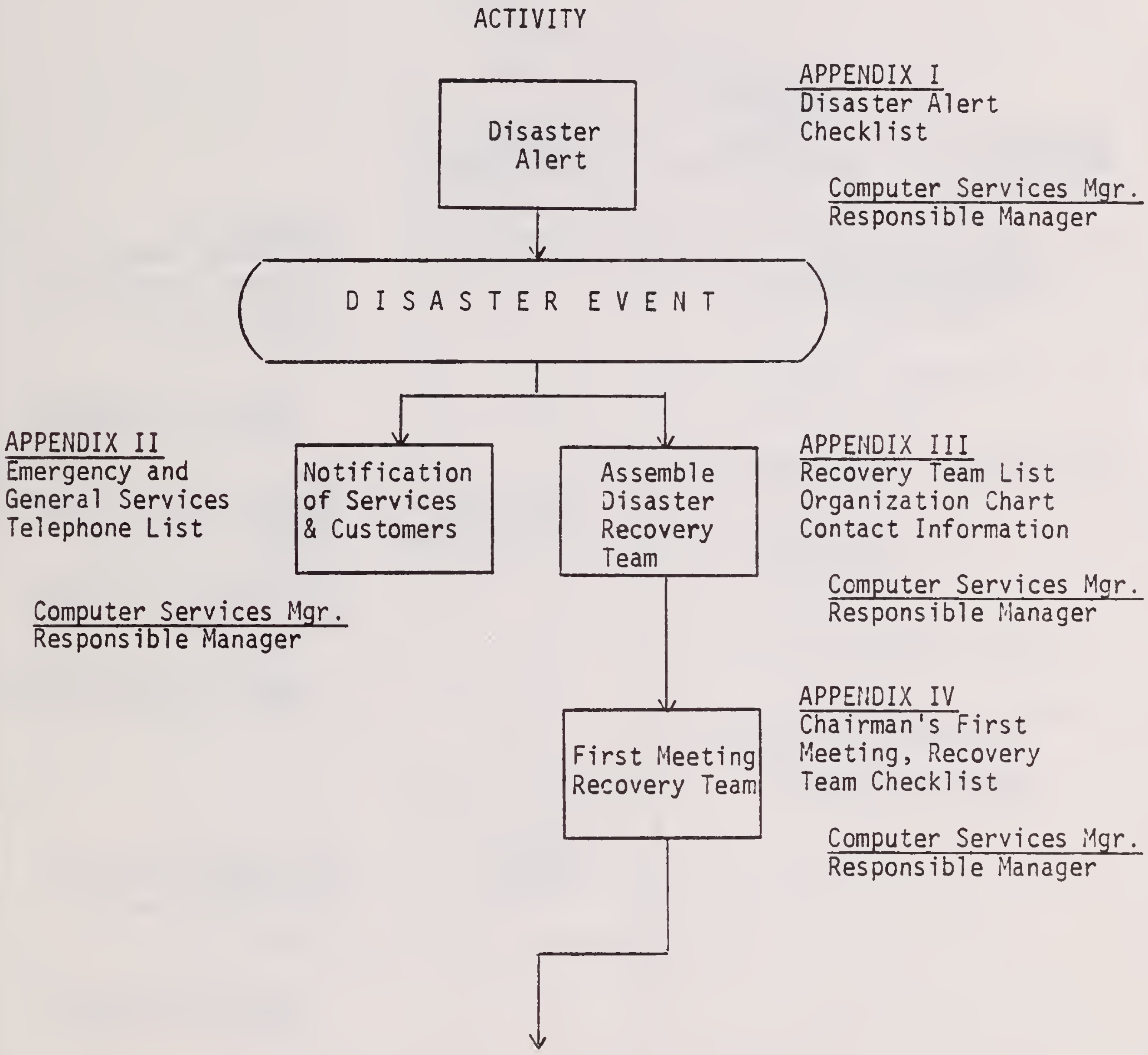
4.0 Scope

This plan is intended to be general and comprehensive. It is an attempt to cover the worst case of a broad range of possibilities. The Recovery Team, under the direction of the Chairman, will develop a detailed plan tailored to the specific situation by selecting applicable elements from this generalized plan. The specific plan will then be disseminated (with appropriate references to this plan) and used in the direction of all recovery actions.

5.0 Disaster Recovery Flow

Figure 1, following, is a somewhat idealized functional flow of a disaster recovery sequence. In order to assure completeness, it assumes a disaster of such magnitude that management of recovery would require substantial division and delegation of recovery functions. For a specific disaster, some functions will not be applicable. Oftentimes, two or more functions can be combined under a single manager.

FIGURE I
DISASTER RECOVERY FLOW



CONTINUED NEXT PAGE

DATA CENTER:

FIGURE I
DISASTER RECOVERY FLOW
(Continued)

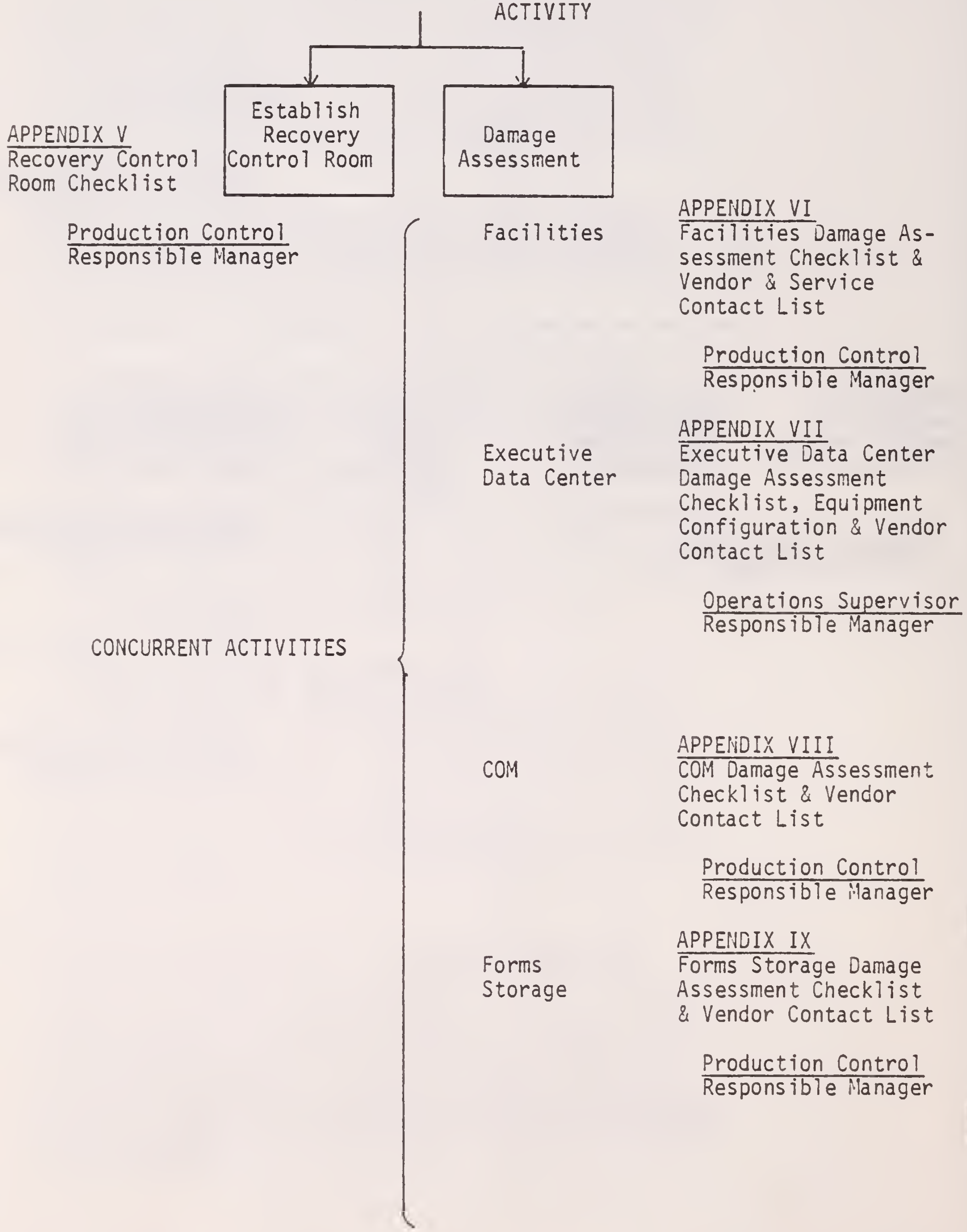
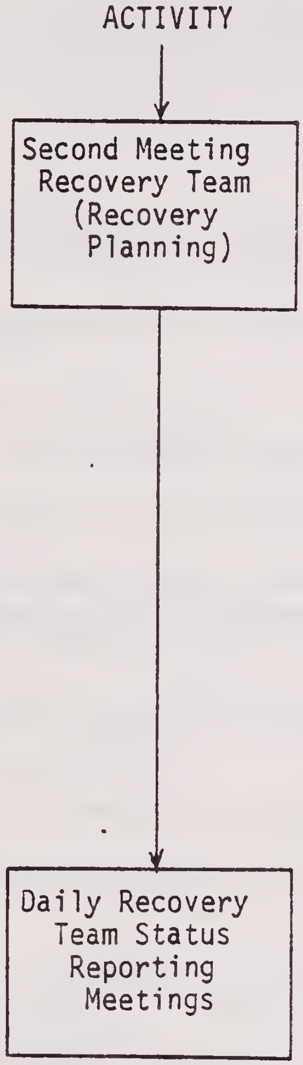

ACTIVITY
APPENDIX V
Recovery Control Room Checklist
Establish Recovery Control Room
Damage Assessment
Production Control
Responsible Manager
CONCURRENT ACTIVITIES
Facilities
APPENDIX VI
Facilities Damage Assessment Checklist & Vendor & Service Contact List
Production Control
Responsible Manager
Executive Data Center
APPENDIX VII
Executive Data Center Damage Assessment Checklist, Equipment Configuration & Vendor Contact List
Operations Supervisor
Responsible Manager
COM
APPENDIX VIII
COM Damage Assessment Checklist & Vendor Contact List
Production Control
Responsible Manager
Forms Storage
APPENDIX IX
Forms Storage Damage Assessment Checklist & Vendor Contact List
Production Control
Responsible Manager

FIGURE I
DISASTER RECOVERY FLOW
(Continued)


ACTIVITY
Second Meeting Recovery Team (Recovery Planning)
Daily Recovery Team Status Reporting Meetings

APPENDIX X

- o Chairman's Second Meeting Checklist
- o Critical Applications List
- o Minimum Hardware Configuration Requirements
- o Software Inventory & Contacts List
- o Line Adapter Configuration List
- o Prime Application Interfaces
- o Alternate Data Center Computing Sites
- o Disaster History Outline

Computer Services
Responsible Manager

6.0 Maintenance of the Plan

Production Control is vested with the overall responsibility for performing quarterly reviews and insuring that the plan is updated. However, it is the responsibility of each functional manager to maintain the checklist assigned to him in Figure I to accommodate changes as they occur.

7.0 Training

The Computer Services Manager is responsible for establishing controls to insure that adequate training is provided to all personnel.

Training must include, but not be limited to:

- First Aid
- Cardio-Pulmonary Resuscitation (CPR)
- Familiarization with:
    - Location of power, water, chemical shut-offs and the location of emergency supplies such as fire extinquishers, hoses, first aid kits, flashlights, etc.
    - Disaster Recovery Team member responsibilities and checklists
    - Disaster procedures including fire, bomb threats, etc.
    - Authorizations and responsibilities for public new releases or announcements.

It is the responsibility of the Computer Center Manager to insure that emergency telephone numbers are posted at strategic places, and to insure that the ________ Fire Department is familiar with the facility and all utility shut-off valves and switches.

8.0 Tests and Drills

The Disaster Recovery Plan will be periodically tested. Drills will be conducted to verify the adequancy of the plan's ability to recover from any threat to continuity of service. The frequency of such tests and drills should be proportional to the probability of the event and potential impact on the Division and its customers. Simulated disaster tests and drills will, as a minimum, be conducted annually and cover major elements of backup and recovery. The Computer Services Manager will plan, schedule, and implement disaster simulation tests.

DATA CENTER:

DISASTER ALERT CHECKLIST

When advance notice is available of an impending event that is likely to significantly disrupt data center operations, advance actions should be taken to limit damage, reduce risk of personal injury, and enhance an orderly shut down. The appropriate steps will depend on the nature of the anticipated event. The following are examples of action for the Disaster Recovery Team Chairman.

1. Assign damage limiting measures
2. Decide at what point in the progression of events to proceed with shut down and evacuation
3. Advise the Administrator and Disaster Team members of the pending event
4. Alert assignees to prepare to implement the following assignments:

Activity	Assigned to
a. Damage limiting measures, e.g. machine covers	Shift Supervisor
b. Orderly shut down; computing, air-conditioning, electrical, chemical and water except sprinkler system	Shift Supervisor
c. Personnel evacuation	Functional Supervisors
d. Provision for security of evacuated facility	Law Enforcement Data System Manager

5. Notify assignees to implement assignments

DATA CENTER:

NOTIFICATION CHECKLIST

Prior to the disaster if possible or soon after the disaster, the following should be notified as appropriate.

- Data Services Division Administrator and Section Managers
- Customers
- Appropriate emergency and utility services (see page 2)
- Restoration Fund Manager (General Services Division) (If appropriate, Governor's Emergency Fund)
- Building owner
- Insurance underwriter
- Official controlled release to news media

Meeting place will be ____________ Police Department, telephone number ________________.

DATA CENTER:

EMERGENCY AND GENERAL SERVICES PHONE LIST

This list of phone numbers should be maintained for the Disaster Plan and also posted at the console/s in the machine room in Data Control.

1. POLICE - CITY OF ________
   Emergency -
   Chief -
   Investigations -

2. POLICE - STATE OF ________
   Patrol -
   General Headquarters -

3. FIRE - CITY OF ________
   Alarm -

4. FIRE - STATE OF ________
   State Fire Marshal -

5. AMBULANCE
   Phone:

6. MEDICAL EMERGENCY
   Phone:

7. WATER - CITY OF ________
   Emergency -
   Superintendent
   Office -

8. ELECTRIC - ELECTRIC CO.
   All Services -

9. COMPUTER VENDOR
   Customer Engineering Services -

10. TELEPHONE COMPANY
    Repair -
    Office -

11. HEALTH DEPT.
    Central Office -
    Environmental -

12. TRANSPOPTATION

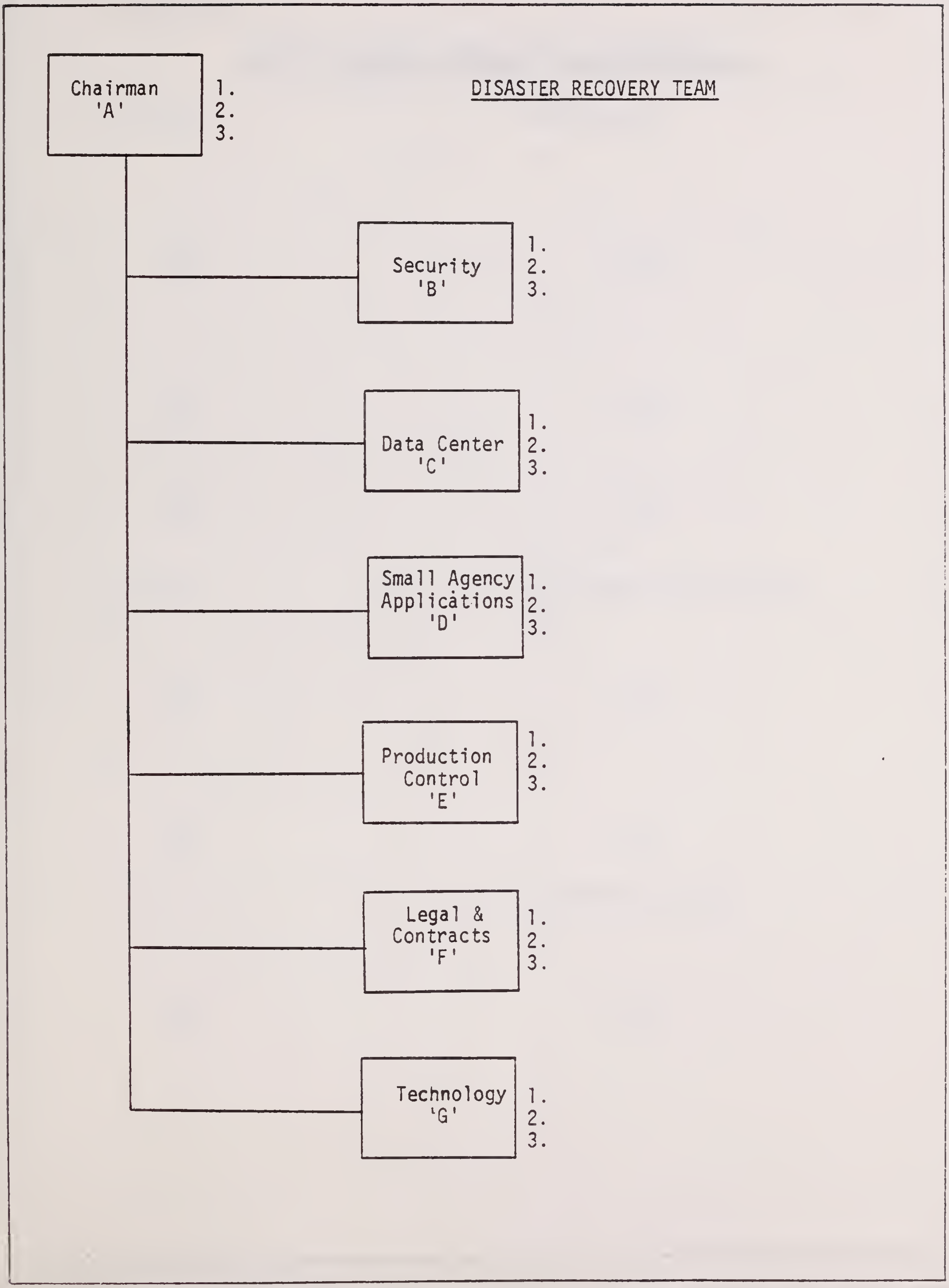
    (Computer Moves)

    (Freight)

    (Air)

    (Freight & Passenger)

DATA CENTER:


DISASTER RECOVERY TEAM
Chairman 'A'
1.
2.
3.
Security 'B'
1.
2.
3.
Data Center 'C'
1.
2.
3.
Small Agency Applications 'D'
1.
2.
3.
Production Control 'E'
1.
2.
3.
Legal & Contracts 'F'
1.
2.
3.
Technology 'G'
1.
2.
3.

DATA CENTER:

ORGANIZATION CHART - COMPUTER SERVICES DIVISION

DATA CENTER:

DISASTER RECOVERY TEAM CONTACT INFORMATION
(Address & Phone Number)

A - Chairman

A1

Bus.
Res.

A2

Bus.
Res.

Bus.
Res.

B - Security

B1

Bus.
Res.

B2

Bus.
Res.

Bus.
Res.

C - Data Center

C1

Bus.
Res.

C2

Bus.
Res.

Bus.
Res.

D - Small Agency Applications

D1

Bus.
Res.

D2

Bus.
Res.

E - Production Control

E1

Bus.
Res.

E2

DATA CENTER:

F - Legal Contracts

F1

Bus.
Res.

F2

Bus.
Res.

G - Technology

Bus.
Res.

G2

Bus.
Res.

Bus.
Res.

ADMINISTRATOR

Bus.
Res.

DATA CENTER:

CHAIRMAN'S
1ST RECOVERY TEAM MEETING
CHECKLIST

Task	Assigned To	Estimated Conclusion	Completed
1. Review status of disaster alert and notification actions	Team	This Meeting	
2. Review status of data center	Team	This Meeting	
3. Assign responsibility for damage assessment			
o Facilities			
o Executive Data Center			
o COM/Data Control			
o Form Storage			
4. Assign responsibility for implementing recovery control room			
5. Set time for completion of damage assessment and next meeting	Team	This Meeting	
6. Assess damage to communication and security systems	Team	This Meeting	

DATA CENTER:

RECOVERY CONTROL ROOM CHECKLIST

REQUIREMENTS	SOLUTION
o Convenient central location	
o Accessible by	
o Floor space 12 x 18	
o Wall space for charts, maps, diagrams; 150 sq. ft.	
o Communications	
o Mail service	
o Telephone (2 lines)	
o Furnishings	
o Recovery Chairman's desk	
o Table for team meetings	
o Secretary desk	
o Typewriter	
o Filing cabinet	

STATE OF COLORADO
DISASTER RECOVERY PLAN

Appendix VI
Page 1 of 2

DATA CENTER:

FACILITIES

DAMAGE ASSESSMENT CHECKLIST

Information required from backup file:

- o Architectural drawings
- o Electrical schematics
- o Furnishings inventory
- o Room layout drawings
- o Disaster Recovery Plan

Item	Damage	Recovery Action Required	By Whom	Estimated Completion Time and Date
1. Site				
o Access				
o Parking				
o Hazards				
2. Building				
o Structural				
o Utilities				
o Water o Sewer o Electrical o Heating o Air Cond. o Telephone				
3. Furnishings				
o Desks				
o Chairs				
o Tables				
o Files				
o Tape racks				
c Bookcases				
o Reproduction equipment				

DATA CENTER:

FACILITIES VENDOR/SERVICES CONTACT LIST

Vendor/Service	Telephone	Address
Architect		
City Engineering Sewer, Water		
Electrical service		
Electrical contractor		
Building contractor		
Heating & refrigeration contractor		
Reproduction machines		
Alarm systems, TV monitor, electric lock		

DATA CENTER:

PRIMARY DATA CENTER
DAMAGE ASSESSMENT CHECKLIST

Item	Damage	Recovery Action Required	By Whom	Estimated Completion Time And Date
1. Machine room				
o Structure				
o Air cond.				
o Electrical distribution system				
o Switching o Cables o Controls				
o Signal cables				
o Fire detection and alarm system				
o Halon system				
2. Computing hardware				
o CPU's				
o Tape drives				
o Disk drives				
o Card readers				
o Printers				
3. Communications				
o Comm control				
o Channel control				

DATA CENTER:

EQUIPMENT CONFIGURATION

DATA CENTER:

PRIMARY DATA CENTER VENDOR CONTACT LIST

Vendor	Telephone	Address

DATA CENTER:

COM AND DATA CONTROL

DAMAGE ASSESSEMNT CHECKLIST

Item	Damage	Recovery Action Required	By Whom	Estimated Completion Time And Date
1. Plumbing				
2. Film processor				
3. Recorder				
4. Duplicators				
5. Special furniture				
6. Supplies				

DATA CENTER:

COM & VENDOR CONTROL
CONTACT LIST

Vendor	Telephone	Address

DATA CENTER:

FORMS STORAGE

DAMAGE ASSESSMENT CHECKLIST

Item	Damage	Recovery Action Required	By Whom	Estimated Completion Time and Date
1. Facility				
2. Check stock				
3. Special forms				
4. Printer paper				

DATA CENTER:

FORMS
VENDOR CONTACT LIST

Vendor	Form	Telephone	Address

(To be completed)

DATA CENTER:

CHAIRMAN'S SECOND MEETING RECOVERY TEAM CHECKLIST

Task	Assigned To	Estimated Completion Time	Completed
1. Obtain and integrate functional damage assessments	Team	This Meeting	
2. Identify and quantify remaining production capability of the Primary Data Center that can be available for production in a few days	Team	This Meeting	
3. Decide which high priority jobs can be done in Primary Center	Team	This Meeting	
4. Identify cleanup and repair required to support production	Team	This Meeting	
5. Assign responsibility for making center ready including: o Clean up o Structural repair o Utilities available o Equipment replacement or repair o Furniture o Communications circuits and equipment			

DATA CENTER:

CHAIRMAN'S
SECOND MEETING
RECOVERY TEAM CHECKLIST

(Continued)

Task	Assigned To	Estimated Completion Time	Completed
6. Assign responsibility for Executive Center production preparation and re-initiation o Backup software & applications o Backup documentation o Supplies, forms, etc. o Schedules o Technical support o Operators			
7. Identify additional production capacity requirements by program	Team	This Meeting	
8. Assign responsibility to locate and negotiate for additional capacity required			
9. Assign responsibility to: o Keep recovery records o Track action assignments o Maintain disaster & recovery history o Collect data & maintain displays in recovery control room			

DATA CENTER:

CRITICAL APPLICATIONS LIST

The following are the most critical applications. All other applications must be reviewed at the time of and during the disaster and prioritized on a case basis.

Economic/Cash Flow Applications	Current Equipment	Alternate On-Site
Law Enforcement Applications		
Legislative Applications		

DATA CENTER:

MINIMUM HARDWARE CONFIGURATION REQUIREMENT

The minimum back-up hardware to substain priority services is:

Primary Data Center

DATA CENTER:

PRIME APPLICATION INTERFACES

Area of Responsibility	Name User Focal Point	Bus. Phone	Home Phone	Alternate	Bus. Phone	Home Phone

DATA CENTER:

ALTERNATE DATA CENTER COMPUTING SITES

There is no computer installation in the ______ area with excess to meet the Division's back-up needs.

Based on assurances from vendors, they would ship the next unit off the production line or units not in use elsewhere. Two to three weeks would probably be required to obtain and install replacement equipment if a suitable site were available.

The most promising sites to re-establish a Data Center are:

Primay Data Center

1.

2.

3.

DISASTER HISTORY OUTLINE

The Disaster Recovery Team Chairman is responsible for establishing and maintaining a record of all disaster recovery activities. The purpose of this history is to serve as a record of events for subsequent reviews and debriefings with government agencies, insurance companies, vendors and suppliers, attorneys, et al. The history record should include, but not be limited to:

- Chronological log of disaster events
- Chronological log of recovery steps
- Analysis of cause of disaster
- Manhours and dollars expended by recovery tasks
- Computation of business interruption costs and other impacts
- Conclusions with respect to ways in which business interruption and/or costs could have been reduced
- Recommendations to minimize impact of future disasters

DATA CENTER:

LIST OF DOCUMENTATION IN THE RECOVERY FILE

The purpose of the recovery file is to maintain updated pre-planned documentation in a mobile unit to enhance the effectiveness to respond to any disaster at any selected location.

Vendor Disaster Procedures and Policies
Recovery Center Floor Plan
Data Center Floore Plan
Architectural Drawings
Electrical Schematics
Room Layout Drawings
Disaster Recovery Plan
Agency Critical Job File and Back-up Locations
Recovery History Log
Disaster Plan Update Schedule
OMIC Data Center Contact List
Emergency Procedures and Drill Schedules
Critical Applications List
Prime Application Interfaces

SECTION X

APPENDIX H

STAFF PROFICIENCY DEVELOPMENT

Introduction

Quality products on timely bases are produced by qualified personnel working with incentive. This applies to all vocations in all industries including data processing. The data processing manager knows the need for fully trained and qualified personnel which only adds to the quest for means whereby this high caliber can be achieved. With technology changing at a rapid pace, both in hardware and software, it is especially difficult to maintain a well-rounded and high staff proficiency level. In the context which is throughout this plan, it is evident that continual training is necessary for the data processing staff and the professional staff who will be using the high level programming languages in an information processing environment. Additionally, as information processing becomes more prominent, managers must become more knowledgeable as to what informational resources are available to assist in applicable endeavors and must develop skill and prudence in the use of these resources.

Data processing has systematically matured and continues to mature at a relatively high rate. The unfortunate phenomenon is that historically the maturing and development of professional staff has not occurred at the same rate. Professional development occurs even today on a segmented irregular, and undisciplined basis. Within State government this pattern has prevailed basically because of two major reasons:

- o Weak management commitment - except in isolated cases management has either not recognized or his ignored the need for quality data processing training. Consequently no definite training programs or plans have been produced nor has any movement been made in pursuit of such.

- o Inadequate funding - very little, if any, funding has been approved by the legislature for the purposes of training. When training funds were requested by management, which has not occurred often, the budgetary process seemed to assign very low priority.

The data processing professional is our most important and expensive data processing asset. The State spends millions of dollars on computer equipment and systems software, yet commits comparatively little management support and funding to professional development. Even though this type of support prevails, the need for staff development continues.

Availability of Training

The data processing training capability within State government is limited. Video playback equipment has been installed at several locations including some Higher Education installations and is shared among the Departments. A statewide contract has been secured with a video training tape vendor which provides the means whereby training courses can be purchased and rented for data processing staff training. Over the years several video training libraries have been established which provide a "core" of tapes most often used. The libraries are updated as needed and the use of tapes is available to all agencies.

Under special circumstances vendors are asked to provide seminars to be held at State facilities. Usually these seminars are sponsored by the State with participating contribution to offset expenses. Technical staff attend these seminars which cover subjects such as operating systems, communications and programming technique.

Additionally, several State agencies sponser training seminars presented by State personnel of various departmental allegience. Curriculum for these seminars is varied and generally designed for the managerial and directorship level of personnel.

Other training which is available to us are the numerous vendor-sponsored seminars designed for the purpose of dispersing information about their products and also to announce new equipment and/or software. Through these seminars the data processing oriented staff can remain abreast of that which is available on the market place.

Conclusion

Executives and legislators must come to the realization that professional development is of prime importance and must be integrated into the broad spectrum of computer related activities. This implies strong commitment in terms of funding, time, and management support. It is imperative that training be acquired in the new technologies and innovative processing techniques. Truly competent professional people are our only real assurance of success in delivering needed data and information processing.

ADP managers must develop a training plan based upon a needs assessment of their professional and technical personnel. Without such a plan it becomes difficult for anyone to develop a program even if resources were available.

Statement of Planning Objectives

- Each agency acquire sufficient data processing staff developmental funding.
- Encourage additional agencies to utilize to a greater extent the video training libraries and equipment.
- Each agency should identify and pursue areas of need in data processing training.
- Continue to enhance the base curriculum of each video training library.
- Provide annual ADP management training seminars for sharing of information among State ADP Managers.

SECTION XI

APPENDIX I

LAW AND POLICY ON THE USE OF SOCIAL SECURITY NUMBERS

Introduction

Within the last 15 years, Congress has enacted many pieces of legislation to enhance and protect an individual's right to control the collection, storage, and disclosure of personal information. Much of this legislation has been developed in response to the increased growth and usage of computer-based information systems. The growth of these information systems led to the development of standards, and the standards enhanced the ability to compare and/or exchange data through the use of common identification numbers. The following information is to REITERATE the laws and policies pertaining to the use of one of these individual identifiers, the Social Security Number.

Authorized Use by Government

The Social Security Act of August 14, 1935 established several social insurance programs to help meet the risks associated with old age and unemployment. Over the years, the scope of these programs has been modified to meet changing needs, but the Act still stipulates that the Secretary shall establish and maintain records on individual earnings, and in carrying out these duties he "shall take affirmative measures to assure that Social Security Account Numbers will, to the maximum extent practicable, be assigned to...any individual who is an applicant for or recipient of benefits under any program financed in whole or in part from federal funds." (42 USC 405 C(2)(B) The Tax Reform Act of 1976 amended Section 205(c)(2) of the Social Security Act to authorize the following governmental uses of the Social Security Number.

"It is the policy of the United States that any state (or political subdivision thereof) may, in the administration of any tax, general public assistance, driver's license, or motor vehicle registration law within its jurisdiction, utilize the Social Security Account Numbers issued by the Secretary for the purpose of establishing the identification of individuals affected by such law, and may require any individual who is or appears to be so affected to furnish to such state (or political subdivision thereof) or any agency thereof having administrative responsibility for the law involved, the Social Security Number (or numbers, if he has more than one number) issued to him by the Secretary." (42 USC 405(C)(2)(C)(i)).

"...A state (or a political subdivision thereof)... which did not use the Social Security Account Number for identification under a law or regulation adopted before January 1, 1975, may require an individual to disclose his or her Social Security Number to such agency solely for the purpose of administering the laws referred to in clause (i) above and for the purpose of responding to requests for information from an agency operating pursuant to the provisions of Part A or D of Title IV of the Social Security Act." (42 USC 405(c)(2)(C)(iii)) Part 'A' pertains to Aid to Families with Dependent Children and Part 'D' pertains to Child Support and Establishment of Paternity.

The Tax Reform Act of 1976 also amended the Internal Revenue Service Code (26 USC 6109) as follows:

> "The Social Security Account Number issued to an individual for purposes of...the Social Security Act...shall...be used as the identifying number for such individual for purposes of this title."

Use by Non-Governmental Organizations

Non-Governmental organizations may use the Social Security Numbers for recordkeeping purposes as such use is neither required nor prohibited by federal law.

Disclosure of Social Security Number

Section 7 of Public Law 93-579, "The Privacy Act of 1974," provides that:

> "(a)(1) it shall be unlawful for any federal, state or local government agency to deny any individual any right, benefit, or privilege provided by law because of such individual's refusal to disclose his Social Security Number.
>
> "(2) The provisions of Paragraph (1) of this subsection shall not apply with respect to:
>
> (A) Any disclosure which is required by federal statute, or
>
> (b) The disclosure of a Social Security Number to any federal, state, or local agency maintaining a system of records in existence and operating before January 1, 1975, if such disclosure was required under statute or regulation adopted prior to such date to verify the identity of an individual."

> "(b) Any federal, state, or local government agency which requests an individual to disclose his Social Security Account Number shall inform that individual whether that disclosure is mandatory or voluntary, by what statutory or other authority such number is solicited, and what uses will be made of it."

Legislative history supports the provisions contained in Section 7 of the Privacy Act which restricts the collection and use of Social Security Numbers by federal, state, and local governmental agencies. These provisions were specifically designed to prevent governmental agencies from conditioning benefits and services upon the supplying of the Social Security Number. For example, voter registration is considered a "right, benefit, or privilege provided by law," and a governmental agency "could not refuse to register a person for failure to disclose his or her Social Security Number, in the absence of a statute or regulation requiring such disclosure for the purpose of positive voter identification. Such statute or regulation would have to have been in existence before January 1, 1976." (S.N. Nichols, General Counsel, Office of Management and Budget)

The Privacy Act Guidelines July 1, 1975, contains several statements with an indirect, but appropriate reference to Social Security Numbers.

1) "In some instances, it may be necessary to include required and optional information on the same data collection form. This should be avoided to the extent possible since the likely effect on some respondents may be coercive, i.e., they may fear that, even though portions of an information request are voluntary, by failing to respond, they may be perceived to be uncooperative and their opportunities would thereby be prejudiced." (See 45 USC 3511, the Federal Reports Act.)

2) "Could the need to be met through the use of information that is not an individually identifiable form." (See e, pg. 46.)

3) "In deciding whether or not to construct an index, agencies must weigh the potential threat of misuse posed by making individual records more accessible against the capability to meet the needs of those individuals for access to their records." (See e, pg. 53.)

Penalties

Whoever discloses, uses, or compels the disclosure of the Social Security Number of any person in violation of the laws of the United States shall be guilty of a misdemeanor and upon conviction thereof shall be fined not more than $1,000 or imprisoned for not more than one year, or both. (42 USC 408 h)

SECTION XII

APPENDIX J

HIGHER EDUCATION

Management Training Seminar

The Division of ADP has held semi-annual management training and coordination seminars for the Directors of computing resources in Higher Education.

These seminars have been very well received and 100% of the institutions have been represented in all meetings.

Programs contain inter-institution dissemination of program support and exchange of applications, the sharing and exchange of equipment and many other activities related to the common good in computing support across institutions in both administrative and instructional areas.

This is the only forum and opportunity for all State Higher Education Data Processing Directors to assemble and the Division of ADP plans to continue these events, within available funding.

Computing in Colorado Higher Education - A Review with Recommendations

The Educom Report, Volume III of the 1979 ADP Master Plan

Equipment Replacements

The titled report made many recommendations related to replacement of obsolete hardware in the institutions of higher education.

Through the regular budgeting and appropriations process, every institution has been able to fulfill the objectives in replacing obsolete hardware.

Advisory Board and Steering Committee

In accordance with the recommendations, the Division of ADP formed a Higher Education ADP Advisory Board with representatives from each institution. Dr. Richard Bond was appointed chairman of the Board and conducted two meetings of the Board. The Board subsequently appointed a Steering Committee composed of one representative from each Higher Education constituted Governing Board.

The Steering Committee met and deliberated many issues, of which one was the review and confirmation of the Division of ADP Budget Recommendations for fiscal years 1980-81 and 1981-82.

Task forces were appointed with specific changes to address the Instruction, Administrative and Research computing support program needs in Higher Education. Volume IV of the 1981 ADP Master Plan contains the results of the task force efforts.

Because of the change in budgeting methods for 1982-83, which provides greater flexibility to each Institution in regard to how appropriations are spent, the Advisory Board and the Steering Committee have been discontinued.